Art. XII.—*New or Little-known Victorian Fossils in the National Museum, Melbourne.*

Part I.—Some Palæozoic Species.

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(With Plates XVI., XVII. and XVIII.).

[Read 11th September, 1902].

? PLANTÆ.

Genus *Bythotrephis*, J. Hall, 1848.

Bythotrephis tenuis, J. Hall. (Pl. XVI., Fig. 1).

B. gracilis, J. Hall, 1848, Palæontology of New York, vol. i, p. 62, pl. 21, fig. 1. [The specific name for this form was afterwards altered by Hall to tenuis, in 1852, on account of its non-agreement with the type specimens of B. gracilis from the Clinton group. See Pal. New York, vol. ii., p. 187].

'*Fucoides*,' Blandowski, 1858, Trans. Phil. Inst. Victoria, vol. ii., pt. 2, pp. 144-5, 2 pls.

Observations.—In the year 1858 W. Blandowski contributed a note to the Philosophical Institute of Victoria, on some fucoid remains which he had found in micaceous and flaggy sandstones in a quarry near the gates of the Botanical Gardens, Melbourne. These specimens were deposited by Blandowski in the Melbourne Museum, the collection in which being afterwards incorporated in the National Museum. The figured specimens, which have not yet come to light, were labelled 2980 and 2981. The specimen now described bears the number 2979 [246][1] and this is now figured.

The absence of any vestige of structure in the so-called fossil fucoids renders their exact determination a matter of some uncertainty. Some forms of hydrozoa, for instance, simulate them in their dendroid habit of growth. The tracks of polychæte

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1 This and all succeeding numbers in *square brackets* refer to registered specimens in the National Museum.

worms, likewise, often resemble the form or outline of a seaweed impression. On the other hand the evidence of a vegetable origin for these remains is strengthened where we have a distinct carbonaceous stain on the rock matrix; or as in these Victorian specimens, a bleached impression, resulting from the leaching of the limonite out of the sandy foundation immediately under the impression, by the decomposition of the vegetable substance, and the formation of an organic acid. And further, the nodose form of parts of the outline in our fossils, as well as their irregular branching habit, is strongly indicative of their plant origin.

This species was recorded by James Hall from the Trenton Limestone of Herkimer County, New York.

Description.—The main stem in this species of Bythotrephis throws off branches and branchlets slightly decreasing in width. Towards their extremities the branchlets have a crispate tendency of growth. Here and there nodosities occur, usually under the branches at the axils, but also along their general surface.

A somewhat analagous species in regard to the angle which the branches make with the main stem, is Brongniart's Fucoides targionii[1], but the more flexuous and slender habit of growth of the Victorian specimens renders the two forms distinct.

Occurrence.—The present examples occur in a fine-grained ferruginous sandstone containing some mica and argillaceous material; the rock resembling in structure an excessively fine arkose, and probably having originated from the finer portion of a granitic detritus. The fossil impressions are pale in colour, or almost white, in contrast to the ochre-coloured matrix, and appear to have been bleached in the manner suggested above.

Locality and Horizon.—Botanical Gardens, South Yarra. Silurian.

ANIMALIA.

Class ACTINOZOA.

Genus *Pleurodictyum*, Goldfuss, 1829.

Pleurodictyum megastomum, Dun. (Pl. XVI., Figs. 2–5).

Pleurodictyum? sp. ind. R. Etheridge, jun., 1896, descr. Tasmanian Sil. Foss., Secretary of Mines Rep., p. 31, pl. 1, fig. 1.

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1 Histoire des Végétaux fossiles, 1828-36, p. 56, pl. iv., fig. 2.

P. megastomum, McCoy MS., W. S. Dun, 1898, Proc. R. Soc. Vict., Vol. X., New Series, pt. II., p. 83, pl. III., fig. 1.

Observations.—By comparing the specimens of Pleurodictyum in the collections at the National Museum, to which Sir Frederick McCoy had attached a MS. name, I am able to verify Mr. Dun's supposition, that the specimens he figures from Mr. Sweet's collection are identical with those previously mentioned by McCoy.[1] Since, however, this form was neither figured or described prior to Dun's paper the reference remains as above.

Some of the specimens in the Museum are of large dimensions, a tabula in one [340] measuring 13 mm. in width, and the corallum 55 mm.

From the very complete examples available, the following diagnosis can be given.

Description.—Corallum roughly circular, or slightly elongated in one direction; base gently convex, often showing across the centre a deep impression of the crinoid stem to which it was in the habit of affixing itself. Epithecal layer of base concentrically rugose, marked by thin wavy ridges. On this basal surface the areas of the corallites are bounded by irregular ridges arranged radially from the centre of the corallum. In this latter feature, and also in its more complanate form, P. megastomum differs specifically from P. stylophorum, Eaton. Area of corallum consisting of from 8 to 14 polygonal corallites united by large mural pores, numbering about 8 or more in the length of the radial walls in one plane, and rather irregularly disposed. Surfaces of tabulæ pustulose, excepting near the periphery of the outer corallites where the surfaces tend to become radially ridged. Width of corallum in an average specimen, 45 mm.; height, 10 mm.

Occurrence.—P. megastomum usually occurs as a cast in the blue or brown Silurian argillaceous limestones; the rock often weathering to a bright yellow in parts, especially in the neighbourhood of the fossils. One of the specimens alone, from locality B. 23 [341], shows the original form and the epithecal layer, but the crinoid stem to which it was attached has been dissolved away.

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1 Ann. and Mag. Nat. Hist., series 3, vol. xx., 1867, p. 201, footnote. Also, Smyth's 1st Progress Report, Melbourne, 1874, p. 34.

Localities and Horizon.—Junction of Woori-Yallock and Yarra Rivers, collected by Geol. Surv. Vict. B. 23 [340-5], and gully near porphyritic dyke west of Mount Disappointment, south of Kilmore, collected by Geol. Surv. Vict. B. 16 [346-8]; specimens in National Museum. Also Kilmore and Mansfield district (Sweet collection, recorded by Dun, *loc. supra cit.*). Probably from Yass[1] (by W. S. Dun); and Yass district,—Bowning series,—New South Wales (by R. Mitchell)[2]; Zeehan, Tasmania (R. Etheridge, jun.). Silurian.

Class CRINOIDEA.

Family ? *Platycrinidae*, Roemer.

Helicocrinus, gen. nov.

Generic characters.—The arrangement of the plates in the dorsal cup is monocyclic. Basals, 3; radials, 5; primibrachs ? (only one preserved in specimen). Tegmen fairly high, vaulted over with numerous polygonal (usually pentagonal) plates. Arms, 5, forked once, ? on third brachial plate; pinnules numerous. Stem pentagonal, with alternate columnals transversely ridged, and crenelate. Evidence of small cirri at intervals down the stem. Proximal end of stem coiled (this last-named character is by no means confined to this genus, but it is so conspicuous in our specimen that it is incorporated in the new generic term merely as a distinction).

Observations.—This type approaches Hapalocrinus, Jaekel,[3] in many respects, but in the latter genus the tegmen is lower, and the stem is round, with longer columnals.

Helicocrinus differs from the typical platycrinids in the larger number of plates which make up the summit or oral region of the test, and also in the pentagonal form of the stem.[4] Its otherwise close relationship with Jaekel's group of the Hapalocrinidae, equivalent as Bather has shown[5] to Wachsmuth and Springer's interpretation of the Platycrinidae, compels one for the present at least, to leave it in this group.

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1 Proc. R. Soc. Vict., new series, vol. x., pt. ii., 1898, pp. 84, 85.

2 Proc. Lin. Soc. New South Wales, series 2, vol. ii., 1887, pp. 412, 413.

3 Palaeontologische Abhandl, Jena, vol. vii. (new series, vol. iii.), 1896-7. p. 95.

4 Wachsmuth and Springer, Revision of the Palaeocrinoidea, pt. iii., Proc. Acad. Nat. Sci. Philad., 1885, p. 314.

5 Geol. Mag., Dec. iv., vol. iv., 1897, p. 344.

Helicocrinus plumosus, sp. nov. (Pl. XVII. and XVIII., Figs. 1–5).

Specific characters.—Dorsal cup small, measuring 6 mm. in greatest width. Tegmen lofty, 13 mm. in height, covered by numerous pentagonal plates. With five arms, each branching once; length of longest arm, 43 mm. Pinnules long and slender, alternating from each side of arm, one to each secundibrach; the latter are slightly longer than broad, and the articulating surfaces are oblique, set on in a zigzag manner. Width of secundibrachs at their base 1 mm. Column pentagonal, with alternating ridges and depressions. The ridges are very pronounced at and just above the proximal coiled end of the stem; usually crenelate, with the intermediate area of the columnals finely and transversely striate. Length of column, not including the coiled portion, 88 mm. Greatest width of columnals, 1.5 mm. Proximal end of column coiled in two turns.

In the arrangement of the pinnules this form resembles Hapalocrinus victoriae, which was described by Dr. Bather, in 1897, from the Silurian of Melbourne.[1] A crinoid with a similarly coiled column is seen in Jaekel's Acanthocrinus rex.[2]

Occurrence.—This beautiful and singularly perfect specimen occurs in a fine sandy matrix, which seems to have been well adapted for preserving such a delicate specimen. The upper part of the crown of the fossil is represented in relief, but of the stem and the larger part of the calyx only a hollow cast remains. [384–5].

Locality and Horizon.—From a quarry at West Brunswick, between Albert and Victoria Streets. Silurian.

Family *Decadocrinidae*, Bather.

Genus *Botryocrinus*, Angelin.

Botryocrinus longibrachiatus, sp. nov. (Pl. XVIII., Figs. 6–8).

Specific characters.—Cup dicyclic, subtrigonal. Infrabasals, 5, pentagonal; basals, 5, hexagonal; radials 5, shield shape-

1 Geol. Mag., vol. iv., p. 337, pl. xv.

2 *Op. supra cit.*, p. 16, pl. i.

Tegmen fairly high, covered by small hexagonal plates, a few of which are seen in the impression from the fossil. Arm ossicles smooth, usually having the deep ventral groove exposed. Primibrachs, height equal to width. Secundibrachs slightly elongated. Arms, three of which only are visible, branching on 4th primibrach, giving rise to two slender armlets, which subsequently branch again at unknown intervals (this last structure was seen in detached fragments). Stem pentagonal, with sulcate sides. Stem ossicles short, consisting of large projecting joints, and smaller non-salient ones. Stem canal, pentagonal.

Measurements.—Dorsal cup, 7.5 mm. high; width above, 10 mm.; width below, 3.5 mm. Length of arms visible to 40 mm. Width of stem at 5 mm. below cup, 2.75 mm.

Observations.—This species resembles B. quinquelobus, Bather[1] (from the Silurian of Dudley) in the form of the cup; the arms, however, are slender and more closely adpressed at the axils in our species.

Occurrence.—Found in a bluish micaceous sandstone, which also contains remains of Homalonotus harrisoni. The crinoidal remains occur chiefly in casts, of which, however, good impressions may be taken, as the rock is tenacious.

Locality and Horizon.—Royal Park, Brunswick (probably near the Model Farm). Collected many years since by Mr. T. Harrison, and presented by him to the National Museum. [390–2]. Silurian.

Order OSTRACODA.

Genus *Beyrichia*, McCoy, 1846.

Beyrichia kloedeni, McCoy.

McCoy, 1846, Synopsis Sil. Foss. Ireland, p. 58 (woodcuts). Id., 1851, Brit. Pal. Foss. pt. 2, fasc. 1, p. 135, pl. 1E., fig. 2. Jones, 1855, Ann Mag. Nat. Hist., ser. 2, vol. xvi., p. 165, pl. vi., figs. 7 and 9.

Jones and Holl, 1886, *ibid.*, ser. 5, vol. xvii., p. 349.

This rather variable form appears to be one of the commonest Victorian species, so far as we can tell from the limited collections

[1] Ann. Mag. Nat. Hist., series 6, vol. ix. 1892, p. 189, pl. xi., figs. 1, 2.

already made. Possibly several described varieties are present, including var. torosa, Jones.[1] Many of the specimens from the Silurian of Victoria are represented by hollow moulds of the valves, from which it is possible to obtain a very faithful impression in wax. In others, again, we have a cast of the interior of the valve in relief, the shell having been dissolved completely away.

Locality and Horizon.—Junction of Woori-Yallock and Yarra Rivers. Collected by Geol. Surv. Vict. B. 23. [431-6] Silurian.

Beyrichia kloedeni, McCoy, var. *granulata*, Jones. (Pl. XVI., Fig. 8).

Jones, 1855, Ann. Mag. Nat. Hist., ser. 2, vol. xvi., p. 166, pl. vi., fig. 9. Jones and Holl, 1886, *ibid.*, ser. 5, vol. xvii., p. 350, pl. xii., fig. 2.

Several examples of the above variety were found amongst a collection of specimens labelled Beyrichia in the National Museum, one of which (the specimen now figured) shows the anterior lobe in the hypertrophied condition. [440]. The surface of the valve shows a certain amount of granulation like the variety figured by Prof. Rupert Jones. Our specimen seems to have been slightly crushed between the posterior and middle lobes.

Locality and Horizon.—Junction of Woori-Yallock and Yarra Rivers, east of Melbourne. Collected by Geol. Surv. Vict. B. 23. [437–40]. Silurian.

Beyrichia wooriyallockensis, sp. nov. (Pl. XVI., Fig. 6).

Description.—Valves sub-oblong, with three unequal lobes; the middle lobe is short, extending only halfway to the ventral edge of the valve, freely coalescing with the ventral ends of the anterior and posterior lobes; anterior lobe full, but not much longer than the middle lobe; the hind lobe broader and flatter at the dorsal edge of the valve than the other two, and modified by a vertical sulcus to nearly one-half its length; ends of lobes

[1] Ann. Mag. Nat. Hist., series 2, vol. xvi., p. 167, pl. vi., figs. 10, 11, ? 12.

slightly salient on the dorsal edge of the valve. The curved border has a raised marginal rim.

Measurements.—Length, 2.08 mm.; height, 1.08 mm. Proportions, 25:13.

Observations.—The above species shows some relationship to the well-known B. kloedeni, which we have now recorded from Victoria, and more especially to the variety described and figured by Jones and Holl as var. intermedia of that species,[1] the chief difference being the larger development of the gigot lobe with its vertical sulcus in B. wooriyallockensis. The valve in the latter form is also much longer in proportion to its breadth, and the lobes are distinctly coalescent. Another form to which our specimen at first sight shows affinity is B. admixta, Jones and Holl,[2] especially with regard to the prominence of the free ends of the lobes; the hind lobe in the Victorian species, however, is of quite a different form, and is not adpressed to the hinder curved border of the valve.

Locality and Horizon.—Found at the junction of the Woori-Yallock and Yarra Rivers, east of Melbourne. Collected by Geol. Surv. Vict. B. 23. [446]. Silurian.

Beyrichia maccoyiana, Jones, var. *australiæ*, nov.

(Pl. XVI., Fig. 7).

Description.—This variety is distinguished from the type species by the narrower form of the anterior and middle lobes. In the present variety the hind or gigot lobe is divided by a vertical sulcus; also the area in proximity to the curved border is less encroached upon by the front lobe, and the frill on the ventral edge is consequently more conspicuous.

Observations.—A species of Beyrichia described by Krause from the Lower Silurian (Ordovician) Clays of the Baltic area, namely, B. marchica[3] bears a slight affinity to our form, but the difference in the position of the lobes is very marked.

Locality and Horizon.—Junction of the Woori-Yallock and

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1 Ann. Mag. Nat. Hist., series 5, vol. xvii., 1886, p. 352, pl. xii., figs. 3, 4.
2 Ann. Mag. Nat. Hist., series 5, vol. xvii., 1886, p. 359, pl. xii., fig. 5.
3 Zeitschr. deutsch. Gesellsch., 1889, p. 19, pl. ii., figs. 10, 11.

Yarra Rivers. Collected by Geol. Surv. Vict. B. 23. [441-3]. Silurian.

Beyrichia kilmoriensis, sp. nov. (Pl. XVI., Fig. 9).

Description.—Valves sub-oblong, general area flat. Dorsal line straight, except where broken by the salient lateral lobes. Ventral border well-rounded, especially in front. The two fore most lobes narrow, long, and curved towards the anterior end; the hind-lobe nearly obsolete, most conspicuous at the dorsal edge on the posterior angle. Curved border with an upturned rim. Surface of valves smooth.

Measurements.—Length, 2.45 mm.; height, 1.36 mm.

Observations.—This species and the next one to be described belong to the jugose type of Beyrichiæ, and in the narrowness of the lobes resemble B. complicata, Salter,[1] which, by the way, is a characteristic Ordovician fossil. The tapering character and evanescence of the two foremost lobes in the region of the ventral border in our species, however, is strikingly distinct.

Locality and Horizon.—Found at Broadhurst's Creek, east of Kilmore, Victoria. Collected by Geol. Surv. Vict. Bb 18. [445]. Silurian.

Beyrichia ligatura, sp. nov. (Pl. I., Fig. 10).

Description.—Valves sub-oblong, rather narrow in lateral aspect, surfaces somewhat convex, with the three lobes well-marked. The anterior lobe pear-shaped, salient, and strongly curved towards the antero-dorsal angle; middle lobe narrow pear-shape, and very prominent or even ridgelike, with a slight forward curvature, and salient on the dorsal edge of the valve; posterior lobe smaller than the anterior, pear-shaped and resting against the upturned rim of the ventral border. The other lobes do not quite reach the sulcate area inside the ventral rim of the valve.

Measurements.—Length, 1.6 mm.; height, 1 mm.

Locality and Horizon.—Junction of the Woori-Yallock and the

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1 Mem. Soc. Geol. Surv., 1848, vol. ii., pt. i., p. 352, pl. viii., fig. 16; also M'Coy, Brit. Pal. Foss., 1851, pt. ii, fasc. 1, p. 136, pl. i. E., fig. 3.

Salter, *ibid.*, 1852, fasc. 2, Appendix A, p. ii.

Compare Jones, 1855, Ann. and Mag. Nat. Hist., Ser. 2, vol. xvi., pl. vi., fig. 4.

Yarra Rivers. Collected by the Geol. Surv. Vict. B. 23. [444]. Silurian.

Order PHYLLOCARIDA, Packard.

Sub-Order CERATIOCARINA.

Family *Caryocaridæ*, nov.

Genus *Caryocaris*, Salter, 1863.

Caryocaris angusta, sp. nov. (Pl. XVIII., Fig. 10).

Description.—Carapace bivalved, narrow, oblong, widest at the postero-ventral region; dorsal border straight, ventral gently convex, and well-rounded posteriorly[1]: usually three and a-half times as long as high, but variable in its proportionate length; smooth, with a faint creasing or folding parallel with the ventral margin. Length of figured specimen, 25 mm.; height, 7 mm.

Observation.—C. angusta approaches some varieties of C. wrightii, Salter,[2] from the Skiddaw Slates, especially those with narrow valves, but it differs from them in the less sharply truncate extremities. C. oblongus, Gurley,[3] from the calciferous shales of Canada, also closely approaches the Victorian specimens, but is not quite so long in proportion to its height. The above form was referred by Gurley to the graptolities.

Localities and Horizon.—Collected by the Geological Survey of Victoria, Ba 90 [193-4] and Ba 92 [195] near Guildford; also from the Parish of Coole Barghurk, W.L.S.2. From Castlemaine, associated with Didymograptus caduceus (T. S. Hall collection). Lower Ordovician.

Genus *Saccocaris*, Salter, 1868.

Saccocaris tetragona, sp. nov. (Pl. XVIII., Fig. 11).

Description.—Valves sub-rectangular, oblong,. Length, a little

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1 By the evidence of the position of the caudal appendages derived from the type of the genus *Rhinopterocaris* presently to be described, it seems necessary to reverse the relative position of the valves from that in which it was regarded by Salter, Jones, and Woodward for this particular group, and to take the narrow end as the anterior. By this reading also the valves correspond in position with *Hymenocaris*, which was, however, not so distinctly bivalved.

2 *C. wrightii*, Salter, Jones, and Woodward, 1892, Mon. Brit. Pal. Phyllopoda (Pal. Soc.), p. 89, pl. xiv., figs. 11-15.

3 Journal of Geology, vol. iv., No. 1, 1896, p. 87, pl. iv., fig. 2.

more than two and a-half times the height. Upper and lower edges straight or slightly undulate, and divergent towards the posterior extremity. Ends gently rounded; lower edge of valve apparently notched or fimbriate in some specimens. Length of figured example, 12 mm.; height, 4.5 mm.

Observations.—The valves of S. tetragona as they occur in the Victorian rock-specimen (a pale crumpled shale), are somewhat distorted, but the general outline can be distinctly made out in one or two better preserved examples. Its nearest ally seems to be S. minor,[1] from the Lower Ordovician of Arenig and Portmadoc.

Locality and Horizon.—Collected by the Geological Survey of Victoria B. 26. [196.] Lower Ordovician.

Genus *Rhinopterocaris*, gen. nov.

Generic characters.—Carapace bivalved, long ovate, shaped somewhat like the wing of a dipterous insect. Dorsal border gently convex, ventral more strongly curved; well-rounded posteriorly, tapering more acutely towards the anterior extremity, the anterior portion of the carapace sometimes exhibiting traces of thoracic or rostral structures. The caudal extremity having a short, sharply pointed telson, with vestiges of a sharp stylet. Carapace smooth, but having a few strong lateral folds on the ventral margin, and one on the dorsal margin. Masticatory apparatus like that of Dithyrocaris, but having the highest cusps in the middle of the ridge. An elongate pyriform pit is seen in the area immediately below the dorsal border at the anterior end, which seems to be comparable with the stalk-eye socket of the recent Nebalia, to which the palæozoic phyllocarids appear to be most nearly allied.

Rhinopterocaris maccoyi, Etheridge, fil., sp.
(Pl. XVIII., Figs. 9, ? 16, 17).

Lingulocaris maccoyi, R. Etheridge, fil., 1892, Records Geol. Surv. N. S. Wales, vol. iii., pt. 1, pp. 5–8, pl. iv.

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[1] Jones and Woodward, 1891, Rep. Brit. Assoc., p. 424, figs. 1-17; *Ibidem*, 1892, Mon. Brit. Pal. Phyllopoda Pal. Soc.), p. 86, pl. xiv., figs. 7-9.

Caryocaris curvilatus, Gurley, Journal of Geology, vol. iv., No. 1, 1896, p. 87, pl. iv., fig. 3; pl. v., fig. 3.

Specific characters.—Carapace thin, or even filmy, winglike in appearance, sub-elliptical, well-rounded ventrally, dorsal and ventral margins with deep folds, excepting on the extreme edge. A few oblique wrinkles crossing the ventral folds both ways in the posterior ventral region, which possibly mean a strong original inflation of that part of the carapace. Vestiges of chitinous thoracic or cephalic appendages sometimes preserved at the anterior extremity of the carapace; this end is distinctly blunt in general form in well-preserved specimens, thus differing from that of Lingulocaris. Occasionally the two valves are found united (see Fig. 17). Posterior extremity of carapace occasionally showing a minute tuberculation near the hinge line. Telson short, sharply pointed, and with a laterally attached and oblique stylet. Masticatory apparatus consisting of a maxillary ridge or base, with about eight sharp cusps, the highest being in the middle.

Measurements.—Extreme length of longest specimen figured, 40 mm. Greatest height of same specimen, 11 mm. Average length of carapace without appendages, 30 mm.

Observations.—In the lower Ordovician slates and shales of Victoria certain Phyllocarida occur, often in great abundance. The largest and commonest of these forms was referred by Sir F. McCoy to the genus Hymenocaris, and he gave the provisional or MS. name of H. salteri to the species in 1861.[1] Since that time, although often referred to by the above-mentioned name, it had not been systematically described until 1892, when Mr. Etheridge, jun. (*op. supra cit.*), gave a very complete account of the form, so far as specimens were available, with full references to past records; and figures were also given of some of these Victorian fossils. Etheridge then referred the form to the genus Lingulocaris on account of its general shape; the affinity to Caryocaris, in which genus Salter had previously suggested it should be included,[2] being considered slight, since it differed in its general outline. The specific name maccoyi was then substi-

[1] The ancient and recent Natural History of Victoria. Vict. Intercol. Exhib. Essays, p. 162.

[2] Quart. Journ. Geol. Soc., vol. xix., 1863, p. 139, note.

tuted by Etheridge, for Salter's name had already been attached to a species of Lingulocaris—L. salteriana.

R. R. Gurley has found certain fossil remains in the calciferous series of Summit, Nevada, and Point Levis, Canada, which may be referred to the above genus. They are associated in the North American strata, as in the Victorian, with graptolites of the Lower Ordovician types, and Gurley interprets their structure as representing the polypary of a graptolite, with "the proximal portion possibly thecaphorous." There appears to be no direct evidence, however, which points to that conclusion, and, moreover, the characters of Caryocaris, to which genus Gurley refers them, have been well defined by Messrs. Salter, Jones, and Woodward as a genus of bivalved crustacea of the phyllocarid group.

During my examination of an extensive series of phyllocarid remains in the collection of the National Museum, and in private collections, I was struck with the different appearances shown by the carapaces of these fossils when preserved in a crumpled rock, and when found in a fine-textured shale. For the better preservation of the carapace we naturally turn to specimens preserved in a fine-grained rock, or one which has been subjected to a minimum of deformation. In the fine-textured shales from the north of Lancefield the carapaces are found to be practically smooth in the central area, excepting where roughened secondarily by chemical action between the folia of the rock. The dorsal and ventral borders of the valves are deeply sulcate or folded and traversed obliquely by shorter folds, or sometimes by fine, long, hair-like grooves. In those examples which are found in the crumpled slates or phyllites the valve has been correspondingly crumpled and distorted, often, however, in a most regular manner, and at first suggestive of a primary wrinkling in the carapace itself.

The generic differences which separate this form from other previously described genera of the Phyllocarida is made apparent by the discovery of the exceptionally perfect specimen now figured, and which was collected by the Geological Survey of Victoria at the camp north of Lancefield Ba 27 [174]. This specimen, which is in the collection at the National Museum, shows that the animal possessed a short stylet, like that suggested by Salter

for Caryocaris.[1] The outline of our specimen is essentially different from both Lingulocaris and Caryocaris; and the peculiarly formed rostral processes seen in our specimen seem to be quite unknown in the above-mentioned genera, to which this form might otherwise be somewhat related. The masticatory apparatus has not been recorded from any of its immediate allies, the nearest being the well-known dental ridges of Dithyrocaris, which, however, differ in having the longest cusps at the anterior end instead of the median, as in Rhinopterocaris.

Localities and Horizon.—Rhinopterocaris maccoyi occurs at several of the lowermost horizons in the Lower Ordovician of Victoria, which are characterized by different assemblages of Graptolites. The specimens obtained by the Geological Survey of Victoria, and now in the National Museum, are as follows:—Camp north of Lancefield, Bb 27 [174-7] associated with Tetragraptus fruticosus, T. serra and Phyllograptus typus, in a pale grey slate. Bb 31 [172-3] in chiastolite slate. Bb 39 [167-71] associated with Tetragraptus serra, in dark grey slate. Bb 40 [182-5] in phyllite. Bb 41 [188] in pinkish decomposed shale (caudal appendages). Bb 44, [186-7] in black shale. West of Gisborne, Ba 70 [244] in greenish-grey slate. (?) Barker's Street, Castlemaine, Ba 78 [245] associated with Didymograptus caduceus, Tetragraptus decipens, and Loganograptus logani, in greenish-yellow slate. E. of Guildford, Ba 83 [189] in decomposed shale. Near Guildford, Ba 91 [190-1] associated with Didymograptus sp. and Trigonograptus wilkinsoni, in decomposed shale. From Parish of Coole Barghurk, W.L.S.2 and W.L.S.3 [180-1] in black slate.

Also from Burn's Reef, Chewton, Bendigo, Castlemaine (T. S. Hall collection).

From Castlemaine, an exceptionally large carapace measuring 50 mm. in length, and 20 mm. in greatest height (G. B. Pritchard collection).

Mr. Etheridge's specimens came from Bendigo, and from Baynton's, Campaspe River, Central Victoria.

My best thanks are due to Mr. T. S. Hall, M.A., and Mr. G. B. Pritchard, for their kind loan of specimens which enabled me to work out the details of this and the foregoing species.

[1] Quart. Journ. Geol. Soc., vol. xix., 1863, p. 137 (fig. 15) and p. 139.

Class BRACHIOPODA.

Genus *Siphonotreta*, de Verneuil, 1845.

Siphonotreta maccoyi, sp. nov. (Pl. XVIII., Figs. 12–14).

Description.—Valves sub-circular, front margin broadly rounded, sides irregularly rounded; surface of valves slightly convex and acuminate towards the foramen. Dorsal valve smaller and broader than the peduncle valve. Foramen small. Surface of valves ornamented with a series of fine, numerous and equidistant concentric striations, which are slightly imbricate, and bearing vestiges of blunt spines at distant intervals. Length generally equal to the breadth. The specimens vary considerably in size, and examples of intermediate dimensions occur; those from the Lower Ordovician are usually smaller than those of the Upper Ordovician. Limits of length measurement of specimens in the National Museum, 4 to 10 mm.

This species is easily separable from S. micula,[1] to which it bears most resemblance, by having a much larger number of concentric striæ, which are also finer; the latter form usually exhibit three or four concentric lineations, which are very strong and distinct.

In S. maccoyi the foramen is small and generally obscure, but can be traced by the position of the median fissure, seen in the more or less crushed examples, resulting from the fracture of the thin shell over the pedicle tube. Many of the valves have been distorted by pressure, laterally, longitudinally, or obliquely.

Observations.—In 1867 Prof. M'Coy noted the occurrence of Siphonotreta in Victoria, and referred to the fossils in the following words[2]:—

"As a general rule, the Graptolite slates in every part of the world contain no other fossils. I, many years ago, discovered in Wales, near Builth, the only shell I ever heard of in Graptolite slates (the *Siphonotreta micula*, M'Coy), and I was greatly surprised to recognise it also in Victoria in the Deep Creek section."

Since the above date this fossil has often been quoted as S.

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1 Brit. Pal. Foss., 1852, p. 188, pl. 1H., fig. 3. Also Davidson, Mon. Brit. Sil. Brach. (Pal. Soc.), 1866, p. 76, pl. viii., figs. 2-6.

2 Ann. Mag. Nat. Hist., ser. 3, vol. xx., 1867, p. 201.

micula in lists of Australian fossils. A careful examination of a large number of valves from the Deep Creek section and elsewhere has convinced me that they differ in essential characters from the well-known British species, and the form will I think most appropriately be designated by associating with it the name of its first discoverer.

Localities and Horizons.—Collected by the Geological Survey of Victoria, Bb 29 [198—9] Newham; associated with Didymograptus extensus, Tetragraptus quadribrachiatus, Clonograptus rigidus var. tenellus, Diplograptus sp., Lasiograptus sp., and Phyllograptus typus. Lower Ordovician.

Geological Survey of Victoria, Ba 62 [232-5] and 64 [219 -31], Deep Creek, Saltwater River, north-west of Bulla; associated with Stephanograptus gracilis, Dicranograptus ramosus, Dicellograptus furcatus, Diplograptus sp., and Climacograptus bicornis. Upper Ordovician.

Order PTEROPODA.

Genus *Hyolithes*, Eichwald, 1840.

Hyolithes leptus, sp. nov. (Pl. XVIII., Fig. 15).

Description.—Shell straight, conical, and attenuate, tapering very gradually. (Apex missing.) Aperture opening obliquely towards the extended margin of the dorsal side. Surface of shell convex, but somewhat crushed in the present specimen; marked transversely with convex lines near the apex, but becoming sinuous nearer the apertural end. Sides of shell with a narrow sunken border possibly indicating a lateral angulation. Length when complete, about 50 mm.; length of specimen, 41 mm.; width at aperture, 7.5 mm.; width at broken proximal end, 3 mm.

Observations.—This species shows some affinity with certain forms of Hyolithes described by Billings and Walcott from the Lower Cambrian (Olenellus zone) of Newfoundland, Canada, and the United States, and especially with H. communis, Billings, var. emmonsi, Ford.[1] Our specimen, however, is more attenuate, and the surface striæ are not so fine, the area between them often forming superficial ridges. The specimen figured by Tate from

[1] Bull. U.S. Geol. Survey, No. 30, 1886, p. 137; Walcott, U.S. Geol. Surv. Tenth Ann. Rep. (1888-9) 1890, p. 621, Pl. lxxvii. fig. 4, 4*a*, *b*.

the Cambrian of Curramulka, South Australia, under the name of H. communis, Billings, is not far removed from our specimen in general appearance, but the striæ are finer and the shell is proportionately shorter.[2]

Locality and Horizon.—Collected by the Geological Survey of Victoria, W.L.S.2 [197], Parish of Coole Barghurk. Lower Ordovician.

EXPLANATION OF PLATES XVI., XVII. AND XVIII.

Plate XVI.

Fig. 1.—*Bythotrephis tenuis*, J. Hall. Natural size. [246].

Fig. 2.—*Pleurodictyum megastomum*, Dun. A cast of the corallum of a very large specimen. Natural size. [340].

Fig. 3.—*P. megastomum.* Base of a well-preserved specimen, showing the epithecal surface, and an impression of a crinoid stem-fragment to which the coral was originally attached. Natural size. [341].

Fig. 4.—*P. megastomum.* Taken from a wax squeeze, showing the under surface of a tabula, with radial ridges and tubercles. Natural size. [340].

Fig. 5.—*P. megastomum.* Two radial ridges of the above more highly magnified, to show the quasi-linear arrangement of the tubercles. × 3. [340].

Fig. 6.—*Beyrichia wooriyallockensis*, sp. nov. Right valve; taken from a wax squeeze. × 12. [446].

Fig. 7.—*Beyrichia maccoyiana*, Jones, var. *australiæ*, nov. Left valve. × 10. [441].

Fig. 8.—*Beyrichia klœdeni*, M'Coy, var. *granulata*, Jones. Right valve; a specimen showing the hypertrophied anterior lobe. From a wax squeeze. × 7. [440].

Fig. 9.—*Beyrichia kilmoriensis*, sp. nov. Left valve. × 11. [445].

Fig. 10.—*Beyrichia ligatura*, sp. nov. Right valve. × 15. [444].

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[2] Trans. R. Soc. S. Australia, vol. xv. (1891-2), p. 186, pl. ii., fig. 2.

Plate XVII.

Helicocrinus plumosus, sp. nov. From the Upper Silurian of Brunswick, near Melbourne. Slightly under natural size. [384].

Plate XVIII.

Fig. 1.—*Helicocrinus plumosus*, sp. nov. Calyx showing the arrangement of the plates in the dorsal cup and tegmen. Pinnules not shown. × 2. From a wax squeeze.

Fig. 2.—*H. plumosus*, sp. nov. Part of stem near distal end, with five columnals. × 4. From a wax squeeze.

Fig. 3.—*H. plumosus*, sp. nov. Transverse section of stem. × 4.

Fig. 4.—*H. plumosus*, sp. nov. Coiled proximal end of stem, nearly cylindrical, and with prominent ridges. Taken from a wax squeeze. × 2. [385.]

Fig. 5.—*H. plumosus*, sp. nov. Anterior extremity of a branch, showing the mode of attachment of the pinnules to the secundibrachs. × 2. [384.]

Fig. 6.—*Botryocrinus longibrachiatus*, sp. nov. The stem, dorsal cup, traces of the tegmen, and ventral aspect of brachials. From a wax squeeze. × 2. [390.]

Fig. 7.—*B. longibrachiatus*, sp. nov. Section of stem, with pentagonal canal. × 4. [392.]

Fig. 8.—*B. longibrachiatus*, sp. nov. Two slender armlets, one exposing the furrow for the axial cord. From a wax squeeze. × 3. [391.]

Fig. 9.—*Rhinopterocaris maccoyi*, Eth., fil., sp. An exceptionally perfect specimen, showing the masticatory apparatus. Left valve. × 2. [174.]

Fig. 10.—*Caryocaris angusta*, sp. nov. Left valve. Natural size. [195.]

Fig. 11.—*Saccocaris tetragona*, sp. nov. Right valve. × 2. [196.]

Fig. 12.—*Siphonotreta maccoyi*, sp. nov. Peduncle valve of a large specimen. × 2. [229.]

Fig. 13.—*S. maccoyi*, sp. nov. Dorsal valve of a smaller specimen, broadened by crushing. × 4. [199.]

Fig. 14.—*S. maccoyi*, sp. nov. Interior of a dorsal valve, distorted by pressure. × 4. [198.]

Fig. 15.—*Hyolithes leptus*, sp. nov. Natural size. [197.]

Fig. 16.—*?Rhinopterocaris maccoyi*, Etheridge, fil., sp. Two valves overlapping, and laterally displaced, the dorsal edges being outside. Natural size. [245.]

Fig. 17.—*R. maccoyi*, Eth., fil., sp. Two united valves. × 2. [184.]